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Graphene has attracted lots of attention due to its remarkable electronic and optical properties, thus providing great promise in photonics and optoelectronics. However, the performance of these devices is generally limited by the relatively weak light-matter interaction in graphene. The combination of graphene with noble-metal nanostructures is currently being explored for strong light-graphene interaction. We introduce a novel hybrid graphene-metal system for studying light-matter interactions with gold-void nanostructures exhibiting resonances in the visible range [1]. The hybrid system is further explored for sensing of Rhodamine 6G molecules with respect to the strong surface-enhanced Raman scattering. The interaction between graphene plasmon (supported by nanodot and antidot arrays) and the substrate phonons [2] is also experimentally demonstrated and structural control is used to map out the hybridization of plasmons and phonons, where the graphene is structured by the nanosphere lithography with structural control down to the sub-100 nanometer regime, see Fig. 1.

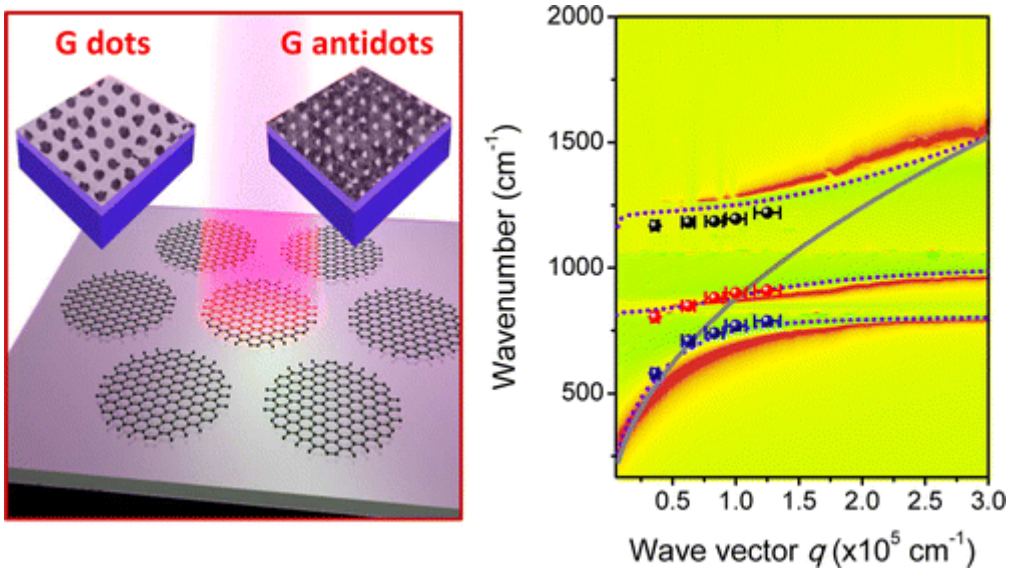

Fig. 1. Plasmon-phonon interaction in graphene nanostructures

References:

[1]. X. Zhu, W. Wang, W. Yan, M.B. Larsen, P. Bøggild, T. G. Pedersen, S. Xiao, J. Zi, and N. A. Mortensen, *Nano Lett.*, 14, 2907 (2014).

[2]. X. Zhu, L. Shi, M.S. Schmidt, A. Boisen, O. Hansen, J. Zi, S. Xiao, and N. A. Mortensen, *Nano Lett.* 13, 4690 (2013).